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ABSTRACT

This leader's guide is designed for units 2 and 3 of the Nebraska 4-H Energy Project. The goals of the project are to: (1) help young people understand energy problems related to life styles; (2) use energy resources carefully; (3) guide members in choosing their own energy alternatives; and (4) to enjoy together the challenges and creativity of finding energy solutions. Goals for units 2 (ages 12-14) and 3 (ages 15-19) include finding ways to reduce utility bills, auditing home energy use for reduced fossil fuel consumption, exploring alternative energy resources (including energy conservation), making energy-wise food choices, monitoring transportation activities, and sharing energy ideas in the community. Included in the guide are instructions for its use, planning pages, and instructional strategies and background information for activities in members' booklets. (Author/JN)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Dear 4-H Leader:

Youth are America's most precious resource. Their futures are at stake due to depletable energy sources and the search for alternatives. Young people are preparing to meet these challenges through energy education and energy conservation. Those who participate in the 4-H Big e Energy Project through the Cooperative Extension Service will:

* learn to use energy efficiently through daily habits
* learn to decrease reliance on non-renewable fossil fuels
* become informed about energy alternatives
* encourage the development of energy resources for the future

Four-H members will be able to complete all activities in Units 2 and 3 and write in them as workbooks. Your endeavors in supporting 4-H'ers are invaluable.

The Big e
4-H Energy Project

The 4-H Energy Project can supplement other 4-H projects, because energy relates to everything. A 4-H member taking Bicycle Safety may find the energy transportation activities helpful. Home energy audits may enhance other 4-H home environment projects.

The 4-H Energy Project is for 9- to 19-year-olds. UNIT 1 (ages 9-11) is contained in one member's book with a separate leader guide. This leader guide is for UNIT 2 (ages 12-14) and UNIT 3 (ages 15-19). At-a-glance planning pages enable leaders to select activities for 6-18 meetings.

GOALS

Goals for Units 2 and 3 are the same. Members should select from activities that will help them learn to—

1—find thrifty ways to reduce utility bills
2—audit home energy use for reduced fossil fuel consumption
3—explore alternative energy resources, including energy conservation
4—make energy-wise food choices
5—monitor transportation activities
6—share energy ideas in the community

4-H Meetings

The type and number of 4-H meetings depends upon your members' needs. One Nebraska 4-H leader of 13 years, with 26 club members, prefers to hold 15 meetings per year, which are a mixture of traditional and informal meetings. The traditional ones begin with the American flag salute, 4-H pledge, call to order, and roll call. Then demonstrations (each member must give a minimum of two annually) are followed by a project-related program given by a resource person.

At the informal meetings of this dynamic club, members meet for announcements, then take a field trip, such as a plane ride for the 4-H Rocketry project. A sizeable number of parents always attend meetings and help with driving, refreshments, advising on projects, and follow-through. These parents are morale-boosters during demonstrations and judging.

Other types of 4-H meetings include project and recreation groups. One leader with a dozen members, meets at a community building to complete a project section, then takes members swimming, bowling, or dancing. In western and plains areas where families travel great distances, family socials and soup/sandwich suppers are popular before 4-H meetings.

Leader Support

Helping 4-H youth to become confident and contributing citizens requires supportive adult leadership—

- observing and listening to 4-H members carefully
- taking a real interest in young people and their growth
- gaining their interest and involvement by asking members to guess outcomes before each activity
- seeking and nurturing the creative spirit and good will in each person
- being sensitive to their needs for worthiness and respect
- enabling 4-H'ers to be DOERS, thus helping them grow in life skills (including abilities to communicate, share ideas)
- helping teens organize thoughts and ideas into plans and action
- understanding each young person's way of doing work
- letting youth take the lead but being near enough for guidance
- giving encouragement and praise when it is earned and needed
- reaching out to other 4-H adults for mutual support and information

Community Responsibilities

Encourage members to present energy programs to church, civic and school groups, and other youth clubs. Community home energy conservation audits can result from the project on computerized house audits. Have members organize car pools to outdoor recreation events, use recycling centers, and plan home draft fixing for the elderly.

USING THE LEADER GUIDE

Leader Planning Pages include Aims, Attitudes, and Activities related to the chapters in Member UNITS 2 and 3. At the first meeting with members and parents, decisions may be made as to—

- selecting activities, dates, and meeting places
- choosing areas of members' interest for demonstrations, inventions, and auditing activities
- sharing someone's home for monitoring meters, and appliances, inspecting weatherstripping, checking heat and cooling equipment
- planning tours
- inviting a speaker to a meeting, such as a utilities spokesperson, career counselor, or carpool organizer
- planning construction of county fair projects, exhibits, and inventions
- collecting supplies for experiments, such as thermometers, tape measures, and insulation

– planning low-energy-use menus for Achievement Night, outings, or parties

With parents' help, select resources for the project –

– add their ideas and talents as resources
– reserve several films and slide sets
– order pamphlets from State Energy Office
– call resource people in energy-related jobs to talk
– invite other groups for films or televised energy programs

Plan tours to visit –

– members' homes to monitor energy use
– utility companies
– power plants
– energy fairs and exhibits
– nursing homes to compare past with present lifestyles
– university departments of physics, engineering, home economics, and agriculture labs
– rural electric plants
– manufacturing plants that use fossil fuel based ingredients, as well as fuel in production
– architect design studios
– gasohol plants
– solar or underground buildings
– gas, coal, or oil field operations
– libraries for research and demonstration materials
– lumberyards for insulation
– hardware stores for draft fixing and project supplies
– building construction sites

PLANNING PAGE FOR UNIT 2

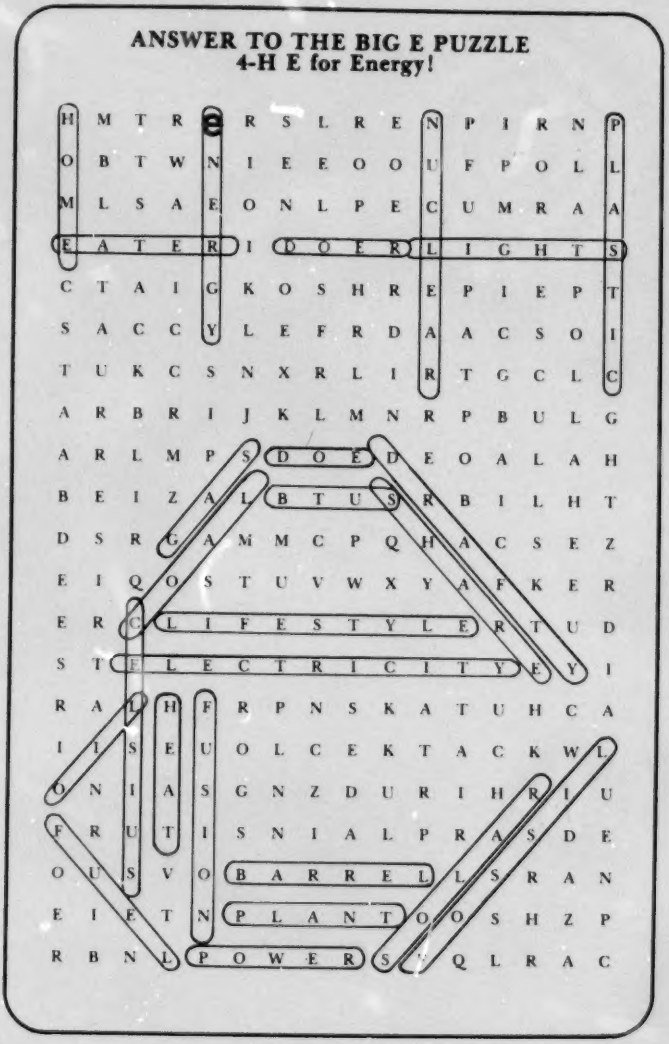
Note: For a 6-to-8-meeting project, select from any of the activities below, numbered to coincide with the six Energy Project goals on the next page. Include the solar "Collector's Box" as a county fair project for Unit 2. Additional activities for a 1-to-3-year project follow every section. These supplement the activities in Member Units.

DATE	PAGE	GOAL	ACTIVITY
	3-5		PROJECT GOALS, MEETINGS, SUPPORT, GUIDE USE, TOURS
	7		A-MAZING FACTS ABOUT ENERGY
	8	1	WHAT'S A PENNY SAVED? WATCH FOR WASTEFULNESS
	9	1	MEET THE METERS APPLIANCE ANALYZER
	10	1	INSULATION SENSATION
	10	2	HOME ENERGY AUDIT
	11	3	ENERGY ALTERNATIVES
	12	3	COLLECTOR'S BOX
	12	4	KITCHEN CONSERVATION
	13	5	TRANSPORTATION - ALL SYSTEMS GO!
	13	6	DEMONSTRATIONS GALORE!
	14	6	ENERGY PLAY
			RESOURCES*

*Resource publications and people are at the backs of Member Units 2 and 3.

A-MAZING FACTS ABOUT ENERGY

The puzzle contains energy words plus a list of definitions. The answer to the puzzle is only in the Leader Guide.



WHAT'S A PENNY SAVED?
WATCH FOR WASTEFULNESS

Assign members to discuss the Aims and Attitudes preceding each Activity in their units.

ACTIVITY:

After club members add pennies, be prepared to give them the town's current population: _____ POPULATION.

The TOTAL U.S. POPULATION is over 225 million x 1 cent = $2,250,000.

TOTAL DOLLARS SAVED MONTHLY by 80 million households = $80 million.

TOTAL GALLONS SAVED PER WEEK for 100 million automobiles x 2 gallons each = 200,000,000 GALLONS. ANNUALLY, 10.4 BILLION GALLONS COULD BE SAVED.

ADDITIONAL ACTIVITIES:

- Encourage members to think through their day's routine and practice energy conservation. What electrical equipment is turned on and left unattended? Is the thermostat lowered when the house is empty? Is it turned down at night? Does the refrigerator door remain open for long periods of time while people decide what to eat? Do members leave water running while brushing teeth? Are clothes washed and ironed at the spur of the moment instead of being planned weekly?
- Cartoons depicting energy-wasters (humans or machines in action) may be planned by the group. Write in energy saving habits under each cartoon. Send the best cartoons to the local or school newspaper.
- Ask a member to make two pie charts of the following information and talk at next meeting. Residential use of energy covers a fifth of total U.S. consumption. The remainder used is about as follows:

40% industrial	20% residential
25% transportation	15% commercial

In homes, energy usually is used for

Heating and cooling	60%
Heating water	15%
Cooling and cooking food	13%
Lighting and appliances	12%

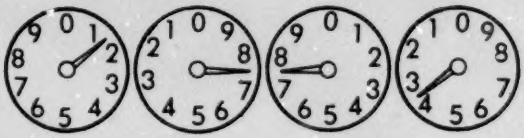
"NAUT": Energy is expensiv All natural resources on Earth are free. Getting them and distributing them costs money.

MEET THE METERS

APPLIANCE ANALYZER

Electricity is a secondary source of energy that requires massive quantities of coal, oil, diesel fuel, moving water or nuclear fuel to generate power. Nearly all of the nation's electrical generating plants rely upon coal as the major source of fuel. Alternative fuel sources for power plants should be supported, developed and perfected. Time is still on our side if we conserve now.

Member Unit 2 has instructions for meter reading. ANSWERS to meter readings are:



1773 x 10 = 17,730 kWh
and 0036 x 10 = 360 kWh

Members should bring copies of electric and other utility bills - one for the summer, one for winter. If unavailable at home, Customer Service of utility companies can provide data. (An average home uses 500 kWh per month.) Have members read bills and compare with meter readings. Encourage someone to give a demonstration. Make sure the bill is based on an actual reading and not a "budget plan" bill.

Natural gas is measured by the cubic foot. Most gas meters will not be converted to metric feet before 1990. Each cubic foot produces about 1,000 BTU's (this varies with fuel quality) of heat energy. Gas flames should be blue in color. Yellow indicates the need for adjustment or cleaning. Encourage members who have gas appliances to check the color with an adult, and to make improvements if needed.

ANSWERS TO ANAGRAMS:

1. Turn off any electricity not being used.
2. Wash clothes in full machine loads.
3. Air dry dishes in dishwasher after rinse.
4. Short showers use less water than baths.
5. Keep appliances in top operating condition.
6. We are savers of electrical energy.

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APPLIANCE ACTIVITY: After members have filled out the utility cost chart in their books, they may be interested in taking to a meeting and comparing an appliance that everyone may have, such as portable hair dryers. The annual cost of one state's 4-H'ers using hair dryers could be $241,500. In a lifetime, $9,660,000!

INSULATION SENSATION

Almost 90 pecent of upper income homes have insulation. But fossil fuel consumption is proportionally greater than lower income families, where 40 percent of homes are insulated. Many older homes were built without adequate insulation when heating costs were low. Now they may need retro-fitting (older home repair with improved insulation and draft fixing). Upper income Americans consume proportionately 1 1/2 times as much natural gas, 2 1/4 times as much electricity, and 5 times as much gasoline due to greater fulfillment of wants and a more mobile lifestyle. Access to energy saving information has been readily available to those in prestige positions, with the result of an increased energy consciousness. However, attitudes and action to conserve energy depends heavily upon information, individual motivation, and comfort tolerances, regardless of income.

The insulation activities in Unit 2 involve stopping heat flow from leaving the home or human body in winter, or from entering the home in summer. Interviewing family members to find the rooms they prefer seasonally and measuring room temperatures, provides an awareness that people vary in comfort needs. Explain that a 5°F (2.6°C) difference between exterior walls and room centers means additional wall insulation is needed unless drafts or the sun's heat are involved. However, ceiling insulation is more effective than wall insulation. The layered socks activity also shows this idea of varying thermal (temperature) needs. When the human foot loses its insulation "seal" through a holey sock, heat is lost as in a "holey" house.

HOME ENERGY AUDIT

ACTIVITY:

Four-H members may obtain a "HOUSE User Input" form from their County Extension office, fill it out and return the audit for a computer analysis of home energy use. When all the computer analyses are in, ask members to share and compare results.

ENERGY ALTERNATIVES

Before 4-H'ers get into futuristic energy alternatives, remind them that this 4-H project has stressed energy conservation as one of the alternatives. It is the most practical method available. For instance, most 4-H families should be able to turn down the thermostats and put on sweaters in winter. Exceptions would be homes with babies, invalids, and elderly. For summer cooling, development of energy attitudes is more difficult where there is low tolerance to humidity or little cross ventilation. Compensation can be made by putting appliances "on the night shift" after 8 p.m., or using low wattage fans, or enjoying outdoor activities in shade.

Reduction of energy consumption can result in savings of 18 million barrels of oil (2.9 billion liters) across America *daily*. Conservation methods are listed here. Have members find metric liters of oil in the chart. (42 gal. x 3.81 = 160 liters per barrel).

CONSERVATION METHOD	DAILY SAVINGS OF OIL IN AMERICA	
	in barrels*	in liters
reduced speed limits	150,000	
lowered thermostats by 2°F (1°C)	50,000	
cold water laundry	300,000	
car tune-ups	200,000	
increased car pools from 1.3 to 2.3 persons per car	200,000	
industrial use reduction	500,000	

On the basis of electric meter readings and home energy audits encourage members to estimate the oil savings in their homes. Example: In watching TV a family uses a barrel of oil (42 gal. x 3.8 liters) per year. KWH + 12 = 1 gallon of oil, KWH + 500 = a barrel of oil.

Annually about 2 barrels of oil are used by the refrigerator, 3 for stove and air conditioning, 10 gallons for vacuum cleaner.

Recycling activities in Units 2 and 3 supplement conservation. National 4-H

* data source: U.S. Treasury Dept.

has initiated an aluminum recycling effort (see Unit 3). Thus far, tin recycling is difficult (e.g., tin coatings on steel food cans). America imports most of its tin.

Members may also research the pros and cons of future energy resources such as gasohol, methanol, biomass, coal gasification, oil shale and tar sands, nuclear, geothermal, tidal power, hydrogen power, laser technology.

COLLECTOR'S BOX

A useful device for hot water heating and storage is the flat plate collector and tank. A small model shows the idea of solar collecting and storage and fits into small exhibit spaces. Members may add circulating pumps if desired, or design any kind of solar collector for any purpose, within a 4 cubic feet (.11 cubic meter) space. In making their collectors, members should always be aware of safety precautions, such as wearing protective gloves when using sheet metal and glass fiber batting to prevent metal cuts and glass slivers.

Criteria for judging their finished models are in their Units. Assign percentage points to these, equally distributed among the four categories.

KITCHEN CONSERVATION

Four-H'ers need to appreciate the increased energy costs involved in growing produce and in meal preparation. What is a low energy favorite meal to one family may be uneconomical to another, depending upon life-styles. ADDITIONAL ACTIVITY: Ask someone to provide chocolate chip cookies, two per club member. Another person may bring paper napkins. Members may be permitted to gobble down the first cookie and to raise hands when finished. The first cookie represents uncontrolled mass consumption of energy. Members should spread upon their napkins, then carefully pick out the chocolate chips or "coal" from the second cookie which is the "Earth." The first pickings represent surface coal deposits. Working into the cookie is "underground mining." As members complain, explain the dangers and difficulty of coal mining and the efforts to extract it. Compare the different "coal piles." Each state has varying amounts of coal also. Members may go on to discuss the "mess" of the environment after mining. Members may brainstorm a cookie recipe that requires no processed ingredients and no baking. Test it on parents at a picnic or 4-H Achievement party. ANSWER TO SODA POP CANS: 3,549 total calories, or 14,196 BTUs of energy are needed per filled can.

TRANSPORTATION - ALL SYSTEMS GO!

ADDITIONAL ACTIVITIES:

- Members should be able to make MPG (KmpL) assessments of their family vehicles.
- Plan with parents a club visit to an auto repair shop to observe the work needed for a car tune-up.
  - -Have a member's family car tuned up. First calculate the MPG (KmpL) before the motor tune-up, then after the tune-up.
  - -Have another member report on MPG (KmpL) amounts before and after a motor tune-up.

- Ask a truck driver to talk to your club about ways that he or she helps conserve gasoline.

- Encourage a 4-H'er to present a talk about "The Effect of Gasoline Rationing on my Family."

- Have members do library research on autos powered by other means than gas turbine engines. Which autos seem most promising in reducing gasoline consumption?

- Show a film about the history of the automobile and its future.
  - -Ask members to follow up with their own drawings or written descriptions of the car of the future.

DEMONSTRATIONS GALORE!

Additional topics to stimulate thinking about demonstrations may be suggested:

FOSSIL FADE OUT - Research, write and report the formation of fossil fuels, their existence as stored solar energy, and our power to harness or destroy them.
ENERGY PRODUCTS - One member may display and explain petroleum-based products, another coal-derived ones.
AN ENERGY GAME - may be designed for a group to play.
KNOW FROM NEWS - Member may report on one energy issue from a scrapbook of newspaper clippings.
HUMAN VS. MACHINE - Design a fossil fuel-saving device and show it alongside its fuel-consuming counterpart.
SUN FOODS - Share some foods cooked or dried in a solar device.

WIND WORK - What can one's own wind catcher do?

GET THE HEAT! - Keep heat where needed by showing how to insulate and wrap water pipes and air ducts.

OUT WITH CRITICAL HEAT LOSS! - Show various ways to insulate ceilings, the critical area of heat loss. Include vapor barriers and non-electric venting of attic or crawl space.

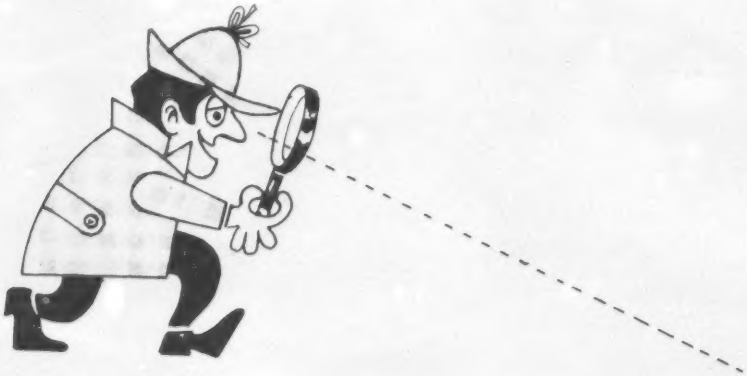
ENERGY INTERVIEW - Incorporate a video taped talk of a person involved with an energy-related job. With the talk use illustrations such as charts.

RE-CYCLE! - Show how to make use of bike power. Or, take apart an old bicycle. Recycle its parts into art objects and useful devices.

RE-TRASH! - List all home trash for a week. Design a plan for reuse of materials. Convince members to try it as a group effort.

ENERGY PLAY

Play writing, planning and producing can bring out the creative best in youth. Include costume designs, backdrop and prop artists, dancers and musicians, if possible. Be sure that someone arranges publicity.



ACTIVITY: An energy play may be presented on Achievement Night or to the community, taped for radio or TV, or in puppetry form. Plays consist of a problem (energy related) and efforts to resolve it. Funny or serious matters affect the problem solving. The climax or turning point arrives next, followed by the denouement (resolution of the problem), and the play ends.

The characters "Naut" or "Surelook Homes, the Great House Detective," may be included in audience entertainment.

LEADER GUIDE TO UNIT 3

(ages 15-19)

LEADER PLANNING PAGE FOR UNIT 3

(FOR SENIOR HIGH 4-H'ERS: AGES 15-19)

Note: For a three-year program of meetings, select from the main activities, as well as from follow-up Additional Activities suggested. In Unit 3 include the "Solar Sampler" for county fair projects.

DATE	PAGE	GOAL	ACTIVITY
	16-17		DEMONSTRATION TOPICS FOR UNIT 3
	18	1	ENERGY IN A FLASH
	18	1	WATCH BEHIND YOUR EERS
	19	2	HOME ENERGY INSPECTION
		2	HOME WEATHERPROOFING
	20	3	ALTERNATIVE RESOURCES
	21	3	SOLAR SEARCH
	22	3	SOLAR SAMPLER
	22	4	EATING YOUR OWN EXPERIMENTS
	22	5	FUN AT THE CARPOOL
	23	6	COMMUNITY SHARING
	24	6	ENERGY-RELATED CAREERS

DEMONSTRATION TOPICS FOR UNIT 3

Many 4-H'ers are required to present at least two demonstrations a year, to develop communications skills.

ENERGY ATTITUDES - Write an energy attitude questionnaire. Conduct a survey in school. Analyze results and report to club meeting.

ENERGY AUDIT - Repair and weatherize own home from ideas in the home audits. Present a slide show of what you have done with home energy improvements.

FAMILY TREAT - Chart a family's progress during the energy project as they develop wise energy use behavior with home heating/cooling, hot water heating, transportation, lighting and appliances.

ARTIST IN ENERGY - Include energy conservation ideas when member shares with the group 5 mini-posters, recycled art sculpture, a song, poetry reading, play or photo story.

APPLY HERE - Include a collage of fuel-consuming home equipment as member explains proper appliance use.

PUT YOUR HEARTH INTO IT - Show how to install glass doors and heat extractors for fireplaces. Compare wood burning stoves and explain with diagrams the most fuel efficient ones found.

YOUR HOME'S AIR FORCE - Show how to maintain and weatherproof around your furnace and flue for heating system efficiency.

HANG IT ALL - Out of plastic and wood or aluminum frames, make some indoor storms for windows and sliding glass doors. Try other window covers such as shutters and insulated shades.

DOORWAYS TO CONSERVATION - Demonstrate how storms and weatherstripping on exterior doors save energy.

THE BIG MOVE - Design an energy plan for a family to reduce auto and van use and change to transportation alternatives.

ENERGY FUTURES - Research, write and report your findings about a future energy alternative such as photovoltaic cells, include cost efficiency facts. (A good start is to read October 1979 FORTUNE magazine.)

IN THE COLD - How can a family prepare for sudden shortages or cut-offs of fossil fuels in winter?

LET THERE BE LIGHT! - Tracing radiant light energy and laser use involves photons. Laser physicists and books may inspire a member to pursue a science that will need many technologists in the 21st century.

PARDON MY ERGS! - It is said that an erg is the energy generated by a mosquito flying full speed. A trillion flying mosquitos may produce one electron volt, or 1.6×10^{12} ergs. About 107 ergs = 1 Joule, or physic's working energy tool of force x length. A future scientist in your group may find expression in explaining energy measures.

SUN RIGHTS/SUN FIGHTS - If everyone had solar buildings but some overshadowed others, how would we resolve ownership of slanting sunbeams that fluctuate hourly, seasonally? Argue your legal case for the sun rights of a client.

ENERGY IN A FLASH

ADDITIONAL ACTIVITY: Members can measure leaky faucets at home by placing a cup under a steady drip for 15 minutes and calculating the amount of water lost in an hour, week, month or year. Water loss requires replacement of faucet parts:

HOW TO FIX A FAUCET

There are two basic types of faucets: stem and single lever. Every faucet in your home should have a spare washer or cartridge replacement part handy. Be sure the parts are the right size.

MATERIALS: a washer that fits your faucet
screw driver
adjustable wrench

METHOD: Close the water shut-off valve under the sink or the main water shut-off valve. Next, open faucet to drain the water out of pipe. TO REPLACE A WASHER IN A STEM FAUCET: First, remove the faucet handle by loosening the screw. Sometimes it is hidden under the decorative plate atop the handle. Pry it up carefully. Use an adjustable wrench to remove the locknut or packing nut. Then remove the stem assembly. Sometimes you have to jiggle it loose. The washer should be underneath it. NOTE HOW THE WASHER FITS IN PLACE. Which side is up? Pry out this old washer with the screwdriver tip and insert a new one exactly in the same position as the old one. (If it doesn't fit, you either have the wrong size or you can rotate it against a metal file to trim it to fit.) SAFETY TIP: Be careful with the screwdriver tip jabbing your hand.

Reassemble the faucet and tighten the stem nut with the wrench. If you have any problems consult a plumber.

To fix a single lever faucet, buy a packaged repair kit that fits your faucet model. Follow the instructions on the kit. Install *all* the new parts, even if some old pieces still look okay. Be sure to have another kit on hand for each faucet for the next repair job!

Check for leaks throughout a house by closing all water-using appliances and faucets. Check the meter reading an hour later. If the reading hasn't changed, the home has no water leaks. If it has changed, there may be a loose connection in a water user.

WATCH BEHIND YOUR EERS

The higher the Energy Efficiency Rating (EER) of an appliance, the more efficiently it will work.

WAYS TO USE AIR CONDITIONERS MORE EFFICIENTLY:

- ☐ **Keep them clean. Dirty units use more energy and work harder. Check owner's manual for cleaning instructions.**
- ☐ **Shut off air conditioners when your family will be gone for the day. There are automatic timers for air conditioners that turn on the units an hour before the family returns home. Check owner's manual.**
- ☐ **Keep out summer sun by closing draperies, shades, and doors.**
- ☐ **Close off rooms not in use and keep all closet doors closed.**
- ☐ **Don't overburden the air conditioner by running heat-generating appliances such as ovens, dryers, irons, dishwashers, especially during the hottest part of the day.**
- ☐ **Shut off all unused electrical lights. (The average light bulb uses only 10 percent of its energy to light; the rest is wasted.)**
- ☐ **On cooler days (below 80° F. or 28° C.) don't run air conditioners. Open doors and windows instead.**
- ☐ **Make sure your home is well insulated. This could save up to 40 percent of cooling costs.**
- ☐ **Sensible purchasing, regular cleaning, and careful use are three major ways to conserve energy with appliances.**

ACTIVITIES: Arrange a field trip to an appliance store to discuss EER's with dealers. A game with appliance labeling is in the Member Unit.

HOME ENERGY INSPECTION

HOME WEATHERPROOFING

ACTIVITIES: To calculate the effectiveness of heating and cooling homes, some states have computer programs to reveal exact areas of the home where energy costs can be reduced. The home audit form can be filled out and discussed by members regardless of a computer analysis. Home life-style differences may result. The activity is intended to stimulate thinking about the 75 percent of household energy budgets involved with heating and cooling.

Simple checking of caulking and weatherproofing around windows and doors enables 4-H'ers to think about draft fixing if needed. Seams of a house — where two different building materials meet — should be sealed to help

regulate heat loss and gain the year around.

- Insulation may improve the efficiency of heating and cooling systems. First, however, families should try to —
- turn thermostats 6° F (3° C) *lower* in the winter and the same degrees ***higher*** in the summer.
- put plastic "storms" on all windows that are single pane
- have furnace serviced every year, filters changed monthly

ADDITIONAL ACTIVITIES:

- Visit a well-insulated and weatherproofed home.* If there is glass fiber insulation take along protective goggles, gloves and a nose mask to emphasize safety. Use a flashlight, and a ruler to measure depth of insulation. Can improvements still be made? If possible, find the costs of insulating the home. Are there moisture barriers on the warm side of exterior-facing surfaces?
- In winter find a simple bird nest. Study the quality of the sheltered environment around the nest. The mother bird serves as a roof over the nest. Take the temperature of the nest with an outdoor thermometer _____ °F (_____ °C). Remove the nest from the tree (songbirds rebuild each year). Take the nest apart and examine it with a magnifying glass. List recycled materials (such as fur, grass, paper, lichens, leather, spider webs). Discuss how nestlings are kept warm. What would a non-insulated nest be like?
- Members may finds ways to conserve heat and protect water conduits from freezing in the event of an emergency power failure. A box of emergency supplies might contain a small camp stove, candles, matches, fire extinguisher, flashlight and spare batteries; transistor radio; extra blankets, afghans and clothing; dry foods, and a fresh water container.
- Members whose families use fireplaces and woodburning stoves may show others the most efficient ways to use these heat sources. Include the vendors and prices of hard and soft firewood.

* It should have insulation inside all exterior facing surfaces (ceiling spaces, walls, basements, floors above unheated areas).

ALTERNATIVE RESOURCES

Earth's energy alpha, the sun, affects all other energy resources. Living in the Energy Age has enabled scientists to discover both non-renewable fuels (the finite fuel sources), and the renewable—such as wood and other plants, wind, solar, tidal and other water sources, hydrogen-derived fuels, and geothermal (Earth's core heat). Four-H'ers may research and show how the sun directly and indirectly affects our energy supplies.

ADDITIONAL ACTIVITIES: Encourage creative ideas in planning and illustrating or modeling a futuristic community for the year 2020 A.D. What will be the occupant's needs? What fuels will be used? Suggest investigation into a number of renewable fuel resource technologies, such as photovolatic cells (both crystals and pellets) and hydrogen power. Presently solar cells convert 15 percent of collected light into productive energy. Wind has the potential to "outshine" the sun in electrical generation. Any wind over eight miles per hour (13 kph)—enough to fully flutter the American flag—can be used to produce electricity. Future homes may become self sufficient wind and power stations. Suggest that someone build a model wind machine and test it at various ground levels and altitudes.

SOLAR SEARCH

ACTIVITY: Members should be able to do a diagram of their homes' position on land in relation to the sun. South exposures can be controlled with trees; glass and other conducting building materials, light colored roofs for reflection in summer and deflection in winter. Trees have always been our greatest assets for summer ventilation, shade and coolness. White painted interior walls are in demand again for reflecting light, thus brightening our homes and reducing our dependency on artificial light.

ADDITIONAL ACTIVITIES: Ask members how they would handle a court case where one neighbor sues another for restricting his sun rights by building a high-rise or planting a large tree and depriving him of at least four hours of midday sun!

- Have members research and construct a sun dial. Its sun relationships can be compared to a building's.
- A solar greenhouse model can be made from a cardboard box and used to grow plants. Prepare members by sharing some solar greenhouse principles: Their purpose is to retain heat loss (through *full* insulation in walls and floors, with wood rather than metal framing). Heat is stored by placement of "thermal mass" (dark heat retainers such as black painted water barrels, rocks, thick walls) in direct line with sunrays. This stored heat is reradiated during sunless periods, including nighttime. They are truly cost effective. They suit both rural and urban settings, can provide families with produce, thermal comfort and supplementary income. A greenhouse can be a joint family productive venture.

Each member should bring a small box, cotton balls, empty black plastic roll film cylinders (recycle these free from photo dealer), clean plastic, tape, scissors, and a milk carton bottom filled with seedlings or seeds in potting soil. First, windows should be cut into the box side and top with plastic taped over.

Four-H'ers can put waterfilled film cylinders alongside the front window to store heat. Arrange cotton balls in empty spaces at box bottom to serve as insulation. Cover box. Set in sun. Four-H'ers should tend plants until next meeting and give reports.

SOLAR SAMPLER

The sky is the limit on what can be designed as an energy-producing or saving model, since everything is traced indirectly back to the sun.

SIZE LIMIT: 4 cubic foot (.11 cu. m.) space (for exhibiting).

Encourage members to research and design a model of a solar related device for the wind, for power production, etc. A building model of cardboard may also be attempted. Some ideas are: a solar swine barn, greenhouse, trombe wall, underground home, or solar (active or passive or modified) home. Judging criteria are in Member Unit 3.

EATING YOUR OWN EXPERIMENTS

Economists predict a consumption pattern for the latter two decades of the century that may equal all the **combined** energy consumption of the nation's entire history! Stress on the American economy in the late 70's was apparent though inflation influenced by oil imports of over 40 percent of total annual petroleum product consumption. Rationing programs were prepared and readied. Many Americans made efforts to reduce fuel consumption through thermostat control, eliminating family summer travel, and curtailing purchases.

ACTIVITIES:

- Plan with the 4-H group to test family reactions to food rationing at the table. Discuss what would happen to people if gas and oil rationing programs were implemented. At the next meeting encourage members to share their families' reactions. How might family lifestyles be affected?

AFTERWARDS:

Let members plan an energy free club hike. Include a lunch or snack of lightweight dried foods prepared by members. Encourage members to do research on commercial preparation of dried foods and share this information on the hike.

FUN AT THE CARPOOL

ACTIVITIES: One way to introduce club members to actually trying carpool-

ing is to plan some group transportation activities:

- Plan a field trip using mass transportation to get downtown, then use the public shuttle or mini-bus service, and have fun at your destination!
- Visit the nearest Department of Highways and Public Transportation to learn about improving gasoline efficiency.
- Invite a representative from the local rides sharing/carpooling program staff to discuss procedures for pooling.
- Encourage the group to design a 4-H T-Shirt, bumper sticker or poster to promote pooling.
- Have the group prepare and carry out a traffic check at one street corner for one week at the same time of day, 30 minutes each time. Be alert to safety needs and add safety considerations at the planning stage. The purpose is:
  - -to determine total traffic and carpooling at a given corner for a week
  - -to study driving habits, observe behavior at a traffic light

What is the best time to gas up? Answer: the coldest part of the day. The colder the gas, the more will fit into the tank. Why keep a full tank of gas?

1. to have adequate supply for emergencies
2. to have less evaporation of surface gas
3. to stop wasting gas after returning for short fill-ups

An auto engine has 20-25 percent energy efficiency. Remainder is lost by engine friction, tire friction, exhaust pipe emission, and incomplete combustion. Only about 25 percent of the fuel burned in the engine gets converted to useful work to turn the driveshaft.

COMMUNITY SHARING

ACTIVITY: Choose among several community energy efforts.

- Retrofitting a member's home (adding insulation to existing building) will enable 4-H'ers to gain experience. Encourage teens to work as teams to help insulate homes of elderly residents.
- Invite a panel of energy resource people to share their energy expertise at a neighborhood meeting or provide several 4-H clubs with the opportunity to share a "conservation conversation" with talks, demonstrations and films.
- Several 4-H clubs can also join together to organize and carry out an all-day solar gala which includes energy exhibits of solar models and designs, solar cookouts, selling solar foods for fund raising, a fashion show for winter clothing (body insulation) and summer ventilation, and an energy conservation play.
- Recycling of newspapers, bottles and cans at a collection depot run by 4-H'ers would also serve the community. Check with your County Extension Office for information about the money-earning 4-H Aluminum Recycling Pro-

gram. In 1979 over 88,000 tons (79,200 t) of aluminum were recycled to save 1.1 billion kWh.

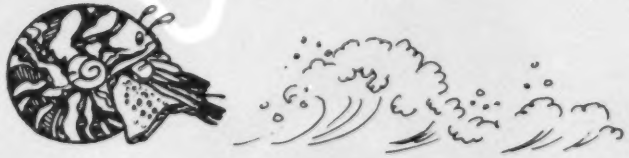
ENERGY-RELATED CAREERS

ACTIVITIES: Senior highers may have many questions about their futures. Many careers into the 21st century will be energy related, specialized, and technical. Four-H members should know that they do have control over career goals. They should not feel they have to settle for "just any job." The quality of their lives is at stake. People need to make career decisions and changes throughout their lifetimes.

- Invite a career counselor from school, or a professional with a job of interest to your 4-H'ers, to speak to the group. Publicize the event and encourage other clubs to attend.
- Another professional may be willing to allow 4-H'ers to visit the job site for firsthand questioning.
- Help youth prepare a job resume. List date of birth and education, honors, hobbies and interests. Job experiences may include farm and home and neighborhood chores, part time work with income listed, and volunteer services.
- The U.S. Department of Energy sponsors PREFACE projects (Pre-Freshman and Cooperative Extension for Minorities and Women in Engineering). These are held for 2-8 weeks during the summer at various universities. Write DOE (address in Member Unit 3) for latest PREFACE locations.
- Encourage members to finish their section in Unit 3 on Energy-Related Careers, and to write associations in their fields of interest.

The 4-H Energy Project encourages skills development in related 4-H projects, such as mechanical science projects. These include Woodworking, Tractor, Small Engines, Aerospace, and Automotive. Many skills are needed in the hundreds of jobs involved with fossil fuel production and distribution, in research and energy generation, marketing, design and conservation.

However, members should be cautioned about seeking careers through advertising gimmicks that seek payment for training and placement. They may avoid pitfalls by reading such information as "After High School, What?" by William D. Green, *American Education Magazine*, October, 1977.



RESOURCES: Additional information sources are listed at the back of each Member Unit.

Films on energy, including gasohol, sun power for farms, and conservation for youth, may be available free on loan from your Cooperative Extension Service, Department of Energy, State Energy Office, or educational service unit through public school and university libraries. Energy research pamphlets prepared by land grant colleges are available from your Cooperative Extension Service. For instance, the NebGuide, "Easy on Energy with Appliances" by Janet Wilson (HEG 78-95) and video-cassette series, 'Easy on Energy" are available at Nebraska's Cooperative Extension offices, or through Ag Communications, Institute of Agriculture and Natural Resources (IANR), University of Nebraska, Lincoln, NE 68583.

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